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appearance of the protoplasmatic network of cells. If these appearances are real, Dr. Heitzmann's best plan of securing recognition for his views would be to send preparations to be examined by histologists of experience in research. The discovery of the reticular character of protoplasm is very interesting, and our author deserves praise for insisting on this point; but we find in his volume little to awaken the expectation that it will earn recognition for the 'bioplasm doctrine;' which, in our opinion, is not shown to deserve serious consideration, although it is possible or even probable that in certain cases a secondary connection is established between the protoplasm of adjacent cells.

It should be added that special consideration of the pathological chapters has been purposely omitted from this notice as inappropriate here.

EUROPEAN ORTHOPTERA.

Prodromus der europäischen Orthoptera. Von C. BRUNNER VON WATTENWYL. Leipzig, Engelmann, 1882. 32, 466 p., 11 pl., map. 8°.

The activity of systematists within the past thirty years has rarely received a more striking proof than in the publication of the volume before us. When H. Fischer published his classic work on European Orthoptera, the number of recognized species on that continent was less than two hundred and fifty. Brunner, one of our leading writers, now places the number at very nearly double the former figure. The increase is particularly marked in the Locustariæ, which have nearly trebled.¹ Already, while Fischer's work was passing through the press, Fieber was making discoveries in the little worked region of south-eastern Europe; and, of late years, Bolivar and others have shown how little the Iberian peninsula was known; yet one would scarcely have looked for such striking additions in so old a field as Europe, and among such bulky insects as the Orthoptera.

Meanwhile there has been great activity in the study of Orthoptera of other parts of the world; and it may safely be said, that, if the number of European Orthoptera has doubled, that of the world at large has quadrupled in the same period. This has entailed much revision and remodelling, in the work of which Brunner, Saussure, and the gifted and lamented Stål, have performed the most honorable part, though they may have been outdone in (diluted) quantity by Walker.

¹ Brunner credits Ephippigera with forty-nine species, of which only ten are given by Fischer. The additions are largely from Bolivar's work in Spain.

There was need, then, that some one should crystallize the methods of recent days for a region so abounding in workers as Europe. This Brunner has now attempted.

He disclaims at the outset any attempt at a monograph. Europe, he rightly says, is no natural province, and the Orthoptera, in the sense of the older naturalists as used in his work, no natural order. For the convenience only of the numerous workers in this region upon the somewhat heterogeneous groups which have been classed under Orthoptera, he issues this Prodromus. It is excellent as a systematic review. The groups are clearly and succinctly defined, but the work is mainly of value in a faunal sense. There is no superfluity of language; analytical tables abound; the balance of parts is admirable; every genus is well illustrated; and, as an expression and synthesis of current taxonomic views, it will serve a most useful purpose. But the biology of these insects is entirely and purposely overlooked; and there is yet room for some one, working upon the excellent model of Fischer, but with the light the newer biological studies have given, to produce a work which shall be classical, and far more fruitful than this can be.

MACHINERY AT PARIS, 1878.

Rapports du jury international, groupe VI., classe 54: Les machines et les appareils de la mécanique générale. Par M. HIRSCH, ingénieur des ponts et chaussées. Paris, Imprimerie nationale, 1883. 8°.

M. HIRSCH has collated and edited the notes of the members of the section of the jury of which he was secretary, and compiled a very extensive and detailed report, with the addition of considerable matter original with himself, thus making a valuable work of the official report. The principal classes of exhibits here examined are steam engines and boilers, with their accessories (divided into stationary and locomotive engines and portable machines), hot-air engines, electric and other motors, hydraulic machinery, compressed-air apparatus, machinery of transmission, machinery of transportation, dynamometers, and miscellaneous parts of machinery. There seem to have been no steam-boilers or accessories from the United States except the Hancock inspirator, which is well noticed. The engines of Corliss and Wheelock are studied at length, and apparently with very satisfactory results, the latter taking the *grande médaille*. A large number of engines were exhibited,—copies of the American Corliss engine, which has evidently

become the best standard among European makers.

Among the hot-air engines, that of Rider is given a leading place, and is fully described. It is commended for its simplicity, its quietness in action, its regularity, and its careful design.

Stow's flexible shafting is noticed as one of the characteristic products of American ingenuity. It consists of two oppositely twisted helices of steel wire, the one enclosing the other, and both covered with a flexible sheath. The device is recommended for the transmission of motion around a corner. These American exhibits were all properly commended in the award of premiums by the jury.

Among other important exhibits from European countries were various forms of 'safety-boilers;' the singular modification of the injector of Giffard, which, by means of the energy of the exhaust-steam, performs the functions of the air-pump in the steam-engine; several forms of compound engine; Hall's pulsometer, which is a modification of the Savery steam-engine of nearly two hundred years ago, with automatically working valves, — an American invention; the gas-engine of Otto, which is said to have exceptional efficiency; the Sagebien vertical water-wheel, which is claimed to have extraordinary performance; the indicator of Deprez, which gives a diagram from the fastest engines; and many other important inventions.

One remarkable feature of the exhibition was the absence of valueless and eccentric devices. This point of difference, in contrasting the exhibition with those which preceded it, is attributed largely to the progress of technical education.

In studying progress, it is noted that the gain is considerable in every direction. In the production of steam, the more general use of 'heaters' of the feed-water is observable, the use of tubular and of the 'safety' forms of boiler is increasing, superheating is oftener practised, better material and workmanship are seen. In steam-engine practice, the use of higher steam, of greater expansion, the adoption of two types exclusively, — the compound of the Wolff type, and the American forms of single-cylinder engines, — greater speed of piston and of rotation, and the use of better material and superior workmanship, are the characteristics of recent practice. Rotary engines are given up. Air and gas engines are extensively used, but only for small powers. Among the hydraulic motors, the turbines are principally used, and have attained great per-

fection in practice as in theory. Aerostation has made no great progress, notwithstanding the interest which it continually awakens.

American exhibitors distinguished themselves by the boldness and the ingenuity of their designs, and by their entire independence of tradition. Their devices are adapted precisely and effectively to their work. "*Les Américains s'attachaient avec énergie à l'idée première, à l'idée juste; ils l'amélioraient, la perfectionnaient, et, même au prix de grandes complications de mécanisme, ils finissaient par la faire triompher, et par l'imposer de nouveau à l'Europe.*"

MINOR BOOK NOTICES.

Conversion-tables of metric and British or United States weights and measures, with an introduction. By ROBERT H. THURSTON, A.M., C.E. New York, John Wiley & Sons, 1883. 83 p. 8°.

IN the introduction, the requirements of any system of weights and measures are given. There is a brief history of the English and French systems, and the supposed advantages of the metric are stated. The difficulties and annoyances arising during the change from the English yard and pound to the metre and gram are suggested as sufficient reason for this book. In the second part, containing the tables of conversion, the units of length, mass, stress, work, and heat, temperature and barometric pressure are defined. A chapter is devoted to c. g. s. units. The tables are full, numerous, and seem to be well arranged, and will, without doubt, be found useful by those having occasion to make measurements. This book forms part of a treatise, in three volumes, on the Materials of engineering, by the same author.

How the great prevailing winds and ocean-currents are produced, and how they affect the temperature and density of lands and seas. By C. A. M. TABER. Boston, Williams, 1882. 82 p. 12°.

This pamphlet, by Capt. Taber of Wakefield, Mass., gives a practical seaman's views on the origin of winds and ocean-currents, and suggests certain very hypothetical causes for glacial climate. The fundamental errors of the work lie in a misconception of the sun's action in producing, and the earth's effect in deflecting, the winds, and in a tendency to refer apparently simple effects to single instead of composite causes. The other side of some of the questions here raised is presented in Tchiatcheff's or Rolland's descriptions of the Sahara, and Woeikoff's and Hann's articles on the general atmospheric circulation.